Concentration of ore metals in hypothermal vein-type tungsten deposit

Kyoko Masukawa[1]; Ken-ichiro Hayashi[2]

[1] Earth evolution sci., Tsukuba Univ.; [2] Graduate School of Life and Environmantal Sci., Univ. Tsukuba

Hypothermal vein-type deposits are a major source of W and Sn. This type mineralization is believed to have associated with deep-seated S-type magma, and is formed from weakly acidic, reduced hydrothermal solutions close to equilibrium with their host rocks. The waters are moderately saline (less than 10 wt % NaCl equiv.) and are largely magmatic origin. However, chemical compositions of ore-forming fluid especially heavy metal contents are poorly known. In this study, we present on a metal concentrations of ore-forming fluid and its temporal change during mineralization from the Takatori deposit which were obtained by synchrotron radiation X-ray fluorescence analyses for single fluid inclusions.

Veins of the Takatori deposit are characterized by the mineralization of early wolframite-topaz-fluorite-muscovite stage, middle sulfides-fluorite stage, late cassiterite stage, and final rhodochrosite-calcite-clay mineral stage. Quartz is the dominant gangue mineral and accompanied through all stages.

Fluid inclusions trapped in quartz are two-phase (liquid and vapor) type. Based on the examination for cutting and crossing relationship among trails of pseudosecondary inclusions, temporal generation of fluid inclusion was determined. These inclusions were analyzed for their metal contents. Doubly polished section of quartz containing fluid inclusions was radiated by synchrotron X-ray at BL-4A, KEK. Intensities of fluorescent X-ray were applied to the theoretically obtained correction equation, and concentrations of metals such as Cu, Zn, Fe, Mn and W were successfully determined. Early stage fluids are characteristic for very high metal concentration; 1300-3700 ppm W, 4100-6200 ppm Fe, 1000-1800 ppm Mn, 1500-3000 ppm Cu and 1800-2900 ppm Zn. However, the metal concentration suddenly dropped to 50-580 ppm Fe, 50-280 ppm Mn, 50-150 ppm Zn and 50-130 ppm Cu in middle to late stages. Tungsten was not detected in fluids of this stage. Final stage fluids contain only Mn of 50-230 ppm.

Our results indicate that the ore-forming fluid at the early stage was higher in heavy metal concentration than those of later stages. Mineralization of wolframite, the main ore mineral in this deposit, has been restricted within the early stage, which was controlled by metal contents in ore-forming fluids.